
Marine Physical Laboratory

Backscatter Data Acquisition for Hydrosweep DS Aboard RV Ewing

Christian de Moustier

Final Report to the
Office of Naval Research
Grant N00014-90-J-1781
For the Period 2-1-91 - 6-30-94



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Abstract

The long term objectives of this work are to establish efficient and accurate signal processing techniques for seafloor remote sensing operations aimed at characterizing the bottom by acoustic methods. This work focuses on acoustic measurements made with a Hydrosweep DS multibeam echo-sounding system installed aboard R.V. M. Ewing. The objectives are to design and implement a data acquisition scheme that preserves base-banded quadrature samples of the output of individual hydrophone staves.

BACKGROUND

Experience gained at the Marine Physical Laboratory with the 16-beam Sea Beam multibeam echo-sounder system led to the design and implementation of acoustic data acquisition systems [de Moustier and Pavlicek, 1987] to record base-banded quadrature samples of the signals received by the 16 preformed beams. Acoustic data collected with this system allowed us to investigate ways of (1) achieving reliable bottom classification by acoustic means [e.g. de Moustier and Alexandrou, 1991; de Moustier and Matsumoto, 1993], and (2) improving the signal processing functions [de Moustier, 1993].

APPROACH

Following advances in operation and integration of the Hydrosweep DS system made aboard R.V. Ewing at the Lamont Doherty Earth Observatory [Chayes et al, 1991], there was scientific interest in improving the beamforming, echo detection and backscatter imaging capabilities of the system. This required developing a system to preserve the acoustic data received by the system at each of its 72 hydrophone staves.

APPROACH

The approach consists of tapping the digital output of each hydrophone channel, performing a base-banding operation and retaining enough samples to provide about twice the Nyquist rate for later processing. These acoustic data are then recorded along with system parameters such as gain settings, pulse length, and transmission mode, and ship attitude data.

ACCOMPLISHMENTS & RESULTS

After reviewing the internal functions of the Hydrosweep DS system, we designed a data acquisition and signal processing architecture and set out to implement it aboard ship. The work was done in collaboration with Dale Chayes, at Lamont Doherty Earth Observatory, who built and implemented the data acquisition system aboard R.V. Ewing. First order tests were conducted during the geophysical survey of the ONR Acoustic Reverberation SRP in July 1992. However, in this initial effort, we learned that the interface to the existing 8-bit digital data was not suitable because of its low dynamic range and the complexity of tapping the current-loop parallel digital data. A second attempt was made, this time to acquire the analog output of the 72 preamps using 16-bit delta-sigma A/D converters. A two channel prototype was built and tested. Hydrosweep support at Lamont lapsed before this data acquisition system could be made fully operational.

Publications

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